Chapter 245

Treatment of malocclusion with orthodontic aligners in a patient with mixed dentures

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ABSTRACT

Malocclusion is one of the major oral problems faced by the world's population. With the advancement of technology and dentistry, over the years, many treatments have been taking space in the labor market, and one of the newest is the invisible appliances. Guaranteeing, mainly, the aesthetics, they provide immeasurable comfort to the patients, compared to traditional orthodontics. This study was carried out on a 10-year-old female patient, over approximately 5 months, with satisfactory results at the end of treatment, which proves that orthodontic aligners have a high success rate in patients with mixed dentition, depending greatly on their collaboration.

Keywords: Malocclusion, Orthodontic Treatment Need Index, Removable Orthodontic Appliances, Pediatric dentistry, Orthodontics, Corrective, Aligners, Children, Orthodontics.

1 INTRODUCTION

The orthodontic treatment with the use of the aligner system is being increasingly sought by patients who enable the aesthetics and speed in the procedure. This type of treatment is having a significant evolution thanks to the great demand of people interested in the method, increasing studies, and comparisons with fixed orthodontics, for example. The work aims to report a clinical case of malocclusion in a child patient in the mixed denture, using orthodontic aligners, bringing knowledge and demonstrating the benefits that it can provide (Mai-Tam, K., 2018).

Although they have been found for more than 15 years on the market and are being increasingly known and studied, there is still a scarcity of papers and articles regarding this method of bite correction (Hennessy, J., Al-Awadhi, EA, 2015).

This new technique was created in 1946 when Kasling proposed a concept of aesthetic apparatus that used a thermoplastic plate to progressively move small misalignments of the teeth (Rossini, G., et al., 2015).

In addition to their greatest advantage, aesthetics, aligners provide other comforts to the patient, such as the possibility of removal at the time of food and beverage intake, also facilitating their hygiene and consequently, greater preservation of the periodontium (Azaripour, A., et al., 2015).

Although this new method of orthodontics depends a lot on the collaboration of the patient, it is undeniable the increase in quality of life, ensures several benefits and facilities in the daily lives of users (Azaripour, A., et al., 2015).

1.1 OBJECTIVES

The clinical case was carried out over 11 months, in the year 2020 to 2021. The purpose of this work is to describe and present the theme through scientific references located in articles searched in Google Scholar, PubMed, and Scielo.

The key words used were: Malocclusion; Orthodontic Treatment Need Index; Removable Orthodontic Appliances; Pediatric dentistry; Orthodontics, Corrective; Aligners; Children; Orthodontics

In the first research, 18 articles were selected, of which 12 were applied because they contained the necessary scientific content and were of interest to carry out the work, written in English and Portuguese.

Since nowadays the aligner system is very little used in children and adolescents, the case study intends to report the efficacy, benefits as well as disadvantages of aesthetic devices.

2 DEVELOPMENT

Considered the founder of orthodontics, Edward Hartley Angle elaborated the classification of dental malocclusions, based on the mesiodistal relationship of the jaw with the dental arch and the base of the skull. According to Tanaka O. 2005, normal occlusion is defined when the mesiovestibular cusp of the first upper molar occludes with the mesial sulcus of the vestibular surface of the first lower molar, which results in a class I bite. Class II is characterized by the first lower molar occluding distally in the upper molar and in class III, the first lower molar occludes mesially concerning the upper (Almeida, S. C. M. 2021).

Orthodontic therapy consists of applying pressures and moving the teeth, through braces that perform these functions. In fixed orthodontics, these are performed through cemented bands, brackets, and steel wires capable of assisting in this movement, depending on the dentist establishing a correct intensity to determine the direction and direction of the displacement (Almeida, S. C. M. 2021).

In recent years, the demand for more aesthetic and comfortable appliances has increased. Kesling proposed, in 1946, a new technique consisting of a series of transparent and thermoplastic positioners that made it difficult for them to have small dental misalignments (Rossini G., et al., 2015).

Over the years, Kesling's idea has been used and modified, but none has surpassed the original technique. In 1999, Align technology launched its Invisalign system, being the first device made, designed, and manufactured by a computer, allowing several dental configurations from a single impression, making the initial theory, in fact, a reality (Hennessy, J., Al-Awadhi, EA, 2015).

The aligners, called first-generation, needed only the device itself to get their results, with no other material involved. Djeu., et al. (2005) compared the technique with fixed orthodontics, obtaining better

results with the traditional treatment in moderate to severe malocclusions. However, similar to marginal rim alignment and root angulation (Hennessy, J., Al-Awadhi, EA, 2015).

As aligners developed, manufacturers began to propose the use of attachments and intermaxillary elastics in an attempt to improve movement. Kravitz et al., 2008., in two studies, evaluated the dental displacements of recent appliances, concluding that there is a large difference between real virtual and clinical outcomes, understanding that second-generation aligners do not stop improving in overall accuracy (Hennessy, J., Al-Awadhi, EA, 2015).

The third generation was developed to improve results and gain greater control of the developed strength. Attachments are placed through the manufacturer's software when extrusions, rotations, and root movements are required. These are positioned where the root torque is needed, allowing the dentist to position them in the desired location. (Hennessy, J., Al-Awadhi, EA, 2015).

The orthodontic treatment with aligners has as its main objective to reestablish a correct functional occlusion comfortable and mainly aesthetic. Based on the literature, there is no standard to be followed when referring to orthodontics. The adaptations to the anatomy of each patient are necessary for the biomechanical principles to be respected, resulting in a correct and desired movement (Bezerra, P.S., 2013).

The purpose of therapy with invisible devices, is, above all, to resolve the patient's complaint. But, what is making it more known and sought after, especially by the younger population, is its speed, comfort, and estética (Bezerra, P.S., 2013).

They guarantee the patient a better quality of life, causing less pain compared to the traditional fixed technique and preserving periodontal health (d'Apuzzo, F., et al., 2019).

As a requirement for choosing the device, the dental surgeon must take into account, in addition to his clinical conduct, the patient's adherence and opinions of specialist orthodontists, since there is limited evidence currently published, making it difficult to study this new technique (d'Apuzzo, F., et al. 2019).

Based on the article by Cordeiro M et al., 2019., the main indications of the aligner system are moderate malocclusion – 1 to 5mm of crowding or dental spacing; deep bite, class II malocclusion, and atresia arches of non-skeletal origin, taking into account the appearance, psychosocial and functional need, risks and contribution of the patient and professional (Cordeiro, M. et al., 2019).

According to Walton 2010., the preferences of children and adolescents differ greatly. Young adults, give more importance to aesthetics, preferring transparent devices. Concluding that, when opting for treatment with traditional metallic devices, colored rubbers are great allies for better acceptance (Walton, D, K., et al., 2010).

Pain is one of the main and most recurrent concerns when it comes to orthodontics, as it directly affects the patient's quality of life. The greatest discomfort is reported in the first 24 hours after installation and continues to regress throughout the week (Fujiyama, K., et al., 2014).

Compared to the traditional metal appliance, the aligners offer minimum comfort throughout the treatment. However, the deformation of the device should be carefully monitored during use, as this movement can cause mild discomfort to the patient (Fujiyama, K., et al., 2014).

The invisible removable appliance enables the removal at the time of food intake and oral hygiene, facilitating the cleaning of the same and the teeth (Azaripour, A., et al., 2015).

Although the gums and teeth are covered for a long period by the appliance, studies show that periodontal health has no increased risks. Patients who use the new method have better periodontal health compared to patients who use fixed orthodontics (Azaripour, A., et al., 2015).

Removable appliances cause a lower accumulation of plaque, precisely because of this possibility of removal at the time of feeding and brushing, which guarantees the patient a lower rate of possible gingival inflammation caused by the bacteria present in the biofilm, also ensuring a lower rate of caries (Azaripour, A., et al., 2015).

Treatment with Invisalign has been available on the market since 1997. They are made using transparent and thin plastic, which fits the entire length of the teeth. They are generally used for at least 20 hours a day and their sequence is changed every two weeks (Lagravêre, M. O., et al., 2005).

The prevalence of malocclusion in patients with mixed dentition ranges from 39 to 93%, depending on age, sex, ethnicity, and classification of the malocclusion. Although scarce, studies show that, nowadays, transparent aligners are considered an option for treatment in children with mixed dentures (Silva, V., M., et al., 2022).

3 CASE REPORT

Patient D. S. P, 10 years old, attended the private dental clinic accompanied by his parents to perform the aesthetic improvement of the smile. At clinical examination, she presented diastemas in the anterior region between 11 and 21; linguoversão do 12 and vestibuloversão e infraoclusion do 13. Resented the malocclusion of Class II, 1st. Division, right subdivision. The harmonious facial profile was replaced by a child ashamed of the smile due to these diastemas that bothered him a lot (Figures 1 to 8). Panoramic radiography showed no alterations that prevented treatment (Figure 9).

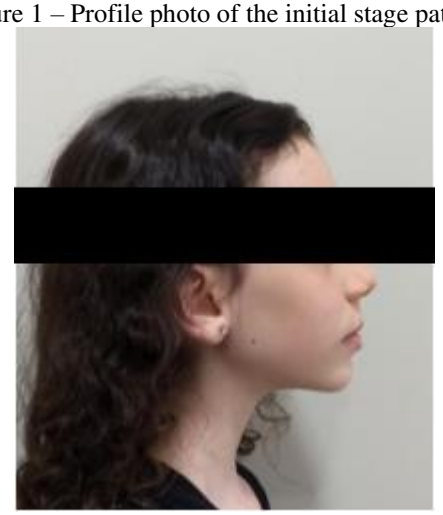
Having demonstrated the available treatment options (metal fixed appliances; aesthetic fixed appliances and orthodontic aligners) the parents in agreement with the professional opted for the latter. Intra-oral scanning (3Shape) was performed and the treatment plan was performed using Invisalign (Align Technology, Inc. 2820 Orchard Pkwy, San Jose, CA 95134) using the Clin-Check Pro Software.

The orthodontic treatment setup for this case consisted of 14 aligners for the upper arc and no aligner was used in the lower arc. This use consisted of a period of approximately 140 days (5 months) of treatment.

The patient was collaborative in the treatment and the changes were visualized in the intermediate phase (Figures 10 to 17). At the end of the use of the 14 aligners, it presented its main complaints resolved within a reasonable time and with good acceptance (Photos 18 to 25).

It should be considered that the use of this type of treatment in a patient with mixed dentures requires a lot of the patient's collaboration and understanding that the treatment only succeeds if it is correctly used.

Figure 1 – Profile photo of the initial stage patient



Source: The Author, 2022.

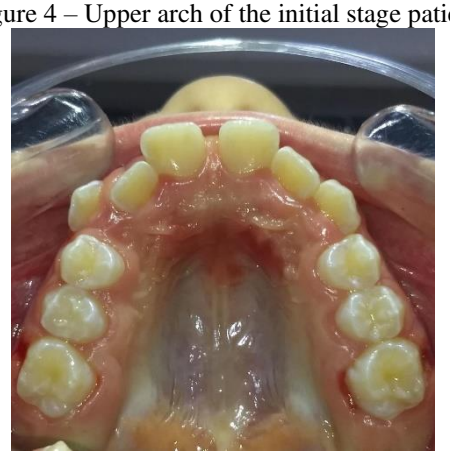
Figure 2 – Front photo of the initial stage patient

Source: A Autora, 2022.

Figure 3 – Front photo of the patient smiling at an early stage

Source: A Autora, 2022.

Figure 4 – Upper arch of the initial stage patient



Source: A Autora, 2022.

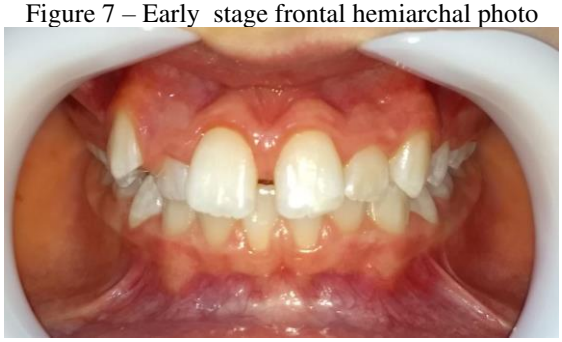
Figure 5 – Early stage lower arcade

Source: A Autora, 2022.

Figure 6 – Hemiarchal photo right side initial stage

Source: A Autora, 2022.

Figure 7 – Early stage frontal hemiarchal photo

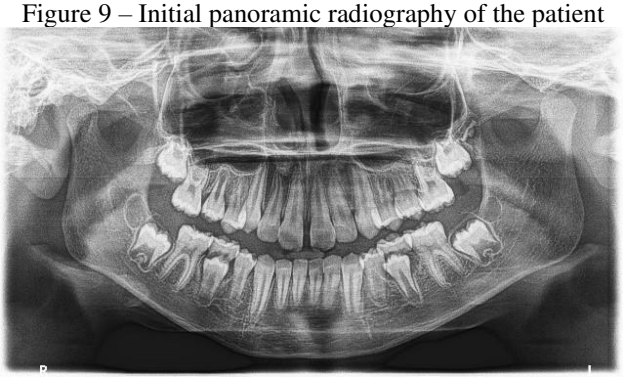


Source: A Autora, 2022.

Figure 8 – Hemiarchal photo left side initial stage

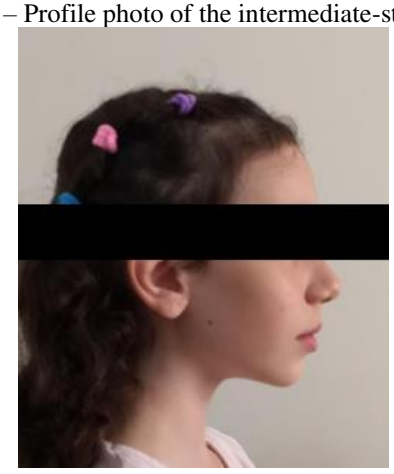
Source: A Autora, 2022.

Figure 9 – Initial panoramic radiography of the patient



Source: A Autora, 2022.

Figure 10 – Profile photo of the intermediate-stage patient



Source: A Autora, 2022.

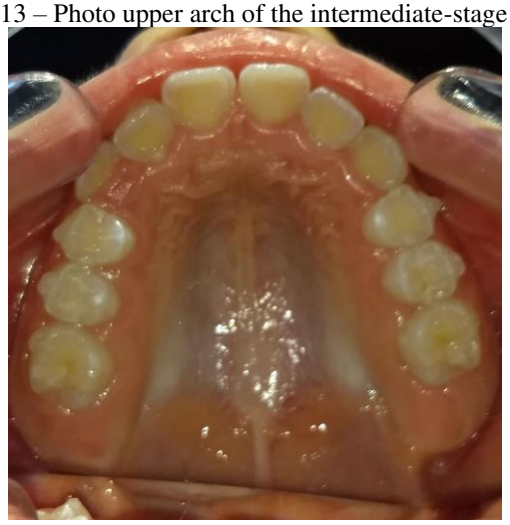
Figure 11 – Front photo of the intermediate-stage patient

Source: A Autora, 2022.

Figure 12 – Front photo of the patient smiling intermediate stage

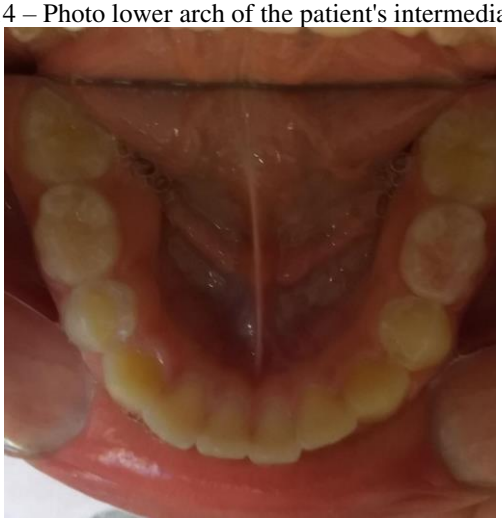
Source: A Autora, 2022.

Figure 13 – Photo upper arch of the intermediate-stage patient



Source: A Autora, 2022.

Figure 14 – Photo lower arch of the patient's intermediate stage



Source: A Autora, 2022.

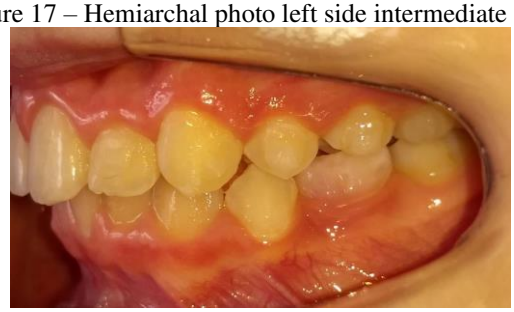
Figure 15 – Hemiarchal photo right side intermediate stage

Source: A Autora, 2022.

Figure 16 – Intermediate stage frontal hemiarchal photo

Source: A Autora, 2022.

Figure 17 – Hemiarchal photo left side intermediate stage



Source: A Autora, 2022.

Figure 18 – Profile photo of the final stage patient

Source: A Autora, 2022.

Figure 19 – Front photo of the final stage patient

Source: A Autora, 2022.

Figure 20 – Front photo of the patient smiling final stage

Source: A Autora, 2022.

Figure 21 – Photo upper arch of the final stage patient

Source: A Autora, 2022.

Figure 22 – Photo lower arch of the final-stage patient

Source: A Autora, 2022.

Figure 23 – Hemiarchal photo right side final stage

Source: A Autora, 2022.

Figure 24 – Photo frontal hemiarch final stage

Source: A Autora, 2022.

Figure 25 – Hemiarchal photo left side final stage

Source: A Autora, 2022.

4 CONCLUSION

In addition to function, nowadays, aesthetics have become a very relevant aspect of orthodontics. The invisible aligners arrived on the market revolutionizing this issue, also ensuring greater comfort to patients. This study showed that the technique has satisfactory results in patients with mixed dentition, who are bombarded with information every day, through the internet, generating a greater interest inharmonious understanding. However, patient collaboration is indispensable for the results to be adequate.

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